MWCOG

RSG INC.
RESOURCE SYSTEMS GROUP, INC.

EPA Webinar on Quantifying Emission Impacts of Clean Energy Initiatives

Using a Time-Matched Hourly Marginal Emissions Tool in Metropolitan Washington

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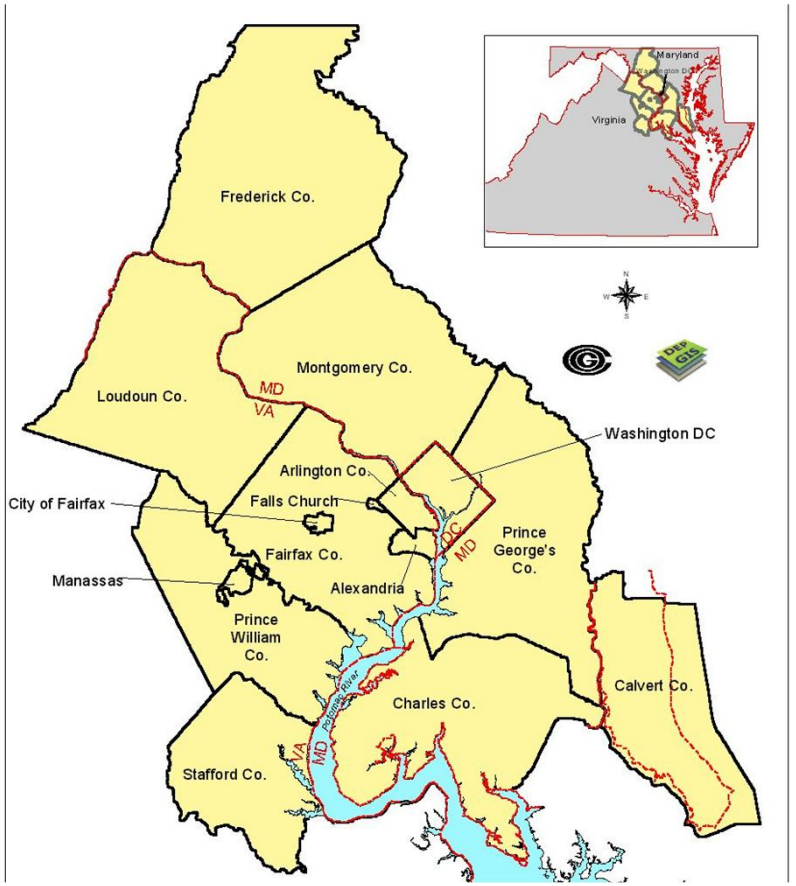
Metropolitan Washington Air Quality Committee (MWAQC) Created, 1992

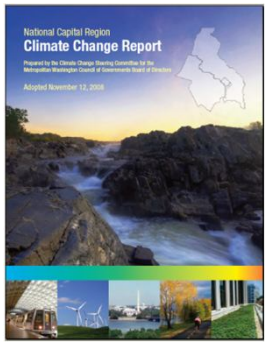
- Metropolitan Washington Air Quality Committee conducts air quality planning for the Washington nonattainment region.
- MWAQC includes state agency representation from Maryland, DC, and Virginia
- Local Government representation
- Supported by Technical Advisory Committee (TAC) and Air and Climate Public Advisory Committee (ACPAC)
- MWAQC is staffed by the Metropolitan Washington Council of Governments



EERE as a Control Measure for the Ozone and PM SIPs

- Wind Power Purchase in 1-hour Ozone SIP
- Expanded Program for 8-hour Ozone SIP and PM2.5 SIP
  - More wind, added Renewable Portfolio Standard, and Energy Efficiency, including Green Buildings and LED Traffic Signals
- Followed EPA Voluntary Measures Guidance
- Included as part of the Voluntary Bundle
- Needed Tool to Estimate Emission Reduction from the Energy Impact

Moving Beyond the Voluntary Bundle



New State Energy and Climate Plans Involve Significant New Energy Initiatives

Governor's COMMISSION on CLIMATE CHANGE VIRGINIA

MARYLAND Commission on Climate Change

Maryland

- EmPower Maryland
- Maryland Climate Action Plan
- RGGI

The District

- District Sustainable Energy Utility
- DC Climate Plan

Virginia

- Virginia Energy Plan
- Virginia Electric Utility Integrated Resource Planning Law
- Virginia Climate Plan

Success Factors

- State and Local Leadership
- Enabling Regulations and Guidance
  - NOx SIP Call/CAIR/CATR (action needed)
  - EPA Voluntary Measures Guidance
  - EPA Roadmap (pending)
- Commitment to Tracking and Reporting
- NEEP EM&V Forum
- DOE/NREL: Funding and Technical Assistance Grant
- MWCOG Avoided Emission Calculator

OZONE TRANSPORT COMMISSION

DDOE DISTRICT DEPARTMENT OF THE ENVIRONMENT

DEQ VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

MARYLAND DEPARTMENT OF THE ENVIRONMENT

Tools for Measuring Avoided Emissions from EERE

- Accurate avoided emissions measurement requires the use of a marginal emissions model that takes account of the time variability of EERE impacts on the grid.
- The model must be applied to the power market area that is impacted by the EERE changes
- MWCOG used the RSG Time Matched Marginal (TMM) Emission model. This was supported by DOE funding.
- RSG built a calculator based on the TMM model that enables MWCOG and local governments to quickly evaluate the avoided emissions from the most common EERE measures in the region. New measures can easily be added to the calculator.

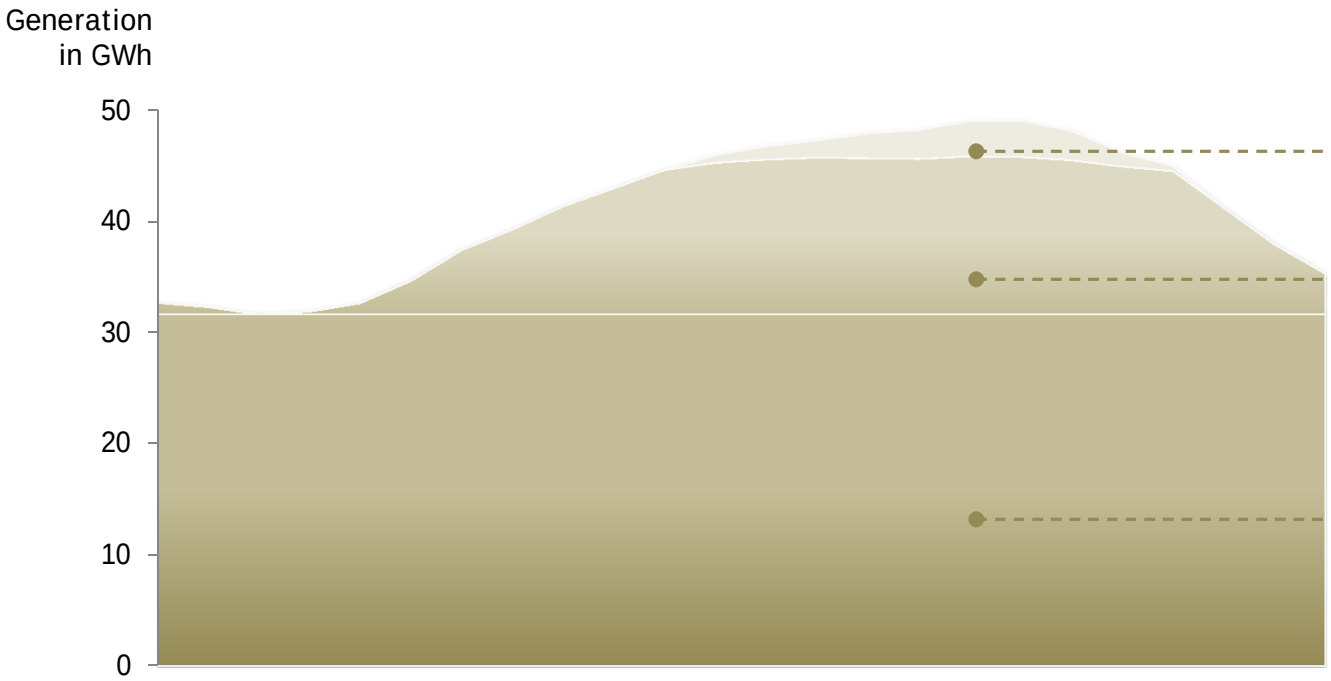
What is the RSG TMM Emissions model ?

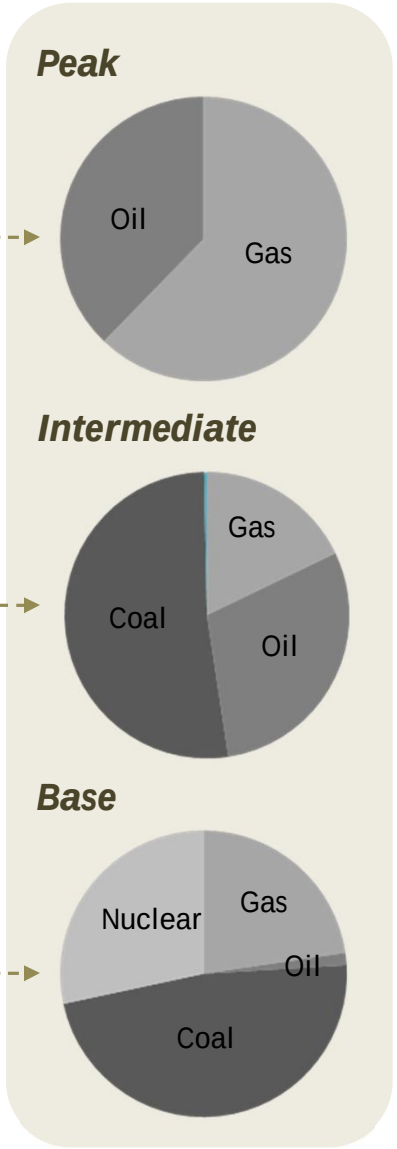
- The TMM model is an 8760 hour historical dispatch model that captures the economic dispatch and reliability decisions made by the electric grid system operator in order to calculate avoided emissions from EERE on an hourly basis.
- The time matching is based on actual or simulated 8760 hour energy savings or generation data from EERE projects or programs in a power market.
- The model is available for all US power markets, states and regions.
- The model has been applied to the analysis of more than 250 EERE projects and programs in the US.
- Model applications include almost all existing and new EERE technologies, nuclear power plants, IGCC coal plants with carbon sequestration, battery storage, flywheels and electric vehicle charging.

TMM Model Overview

The TMM model calculates the grid marginal emission rates from fossil fueled units hour by hour for every day of the year.

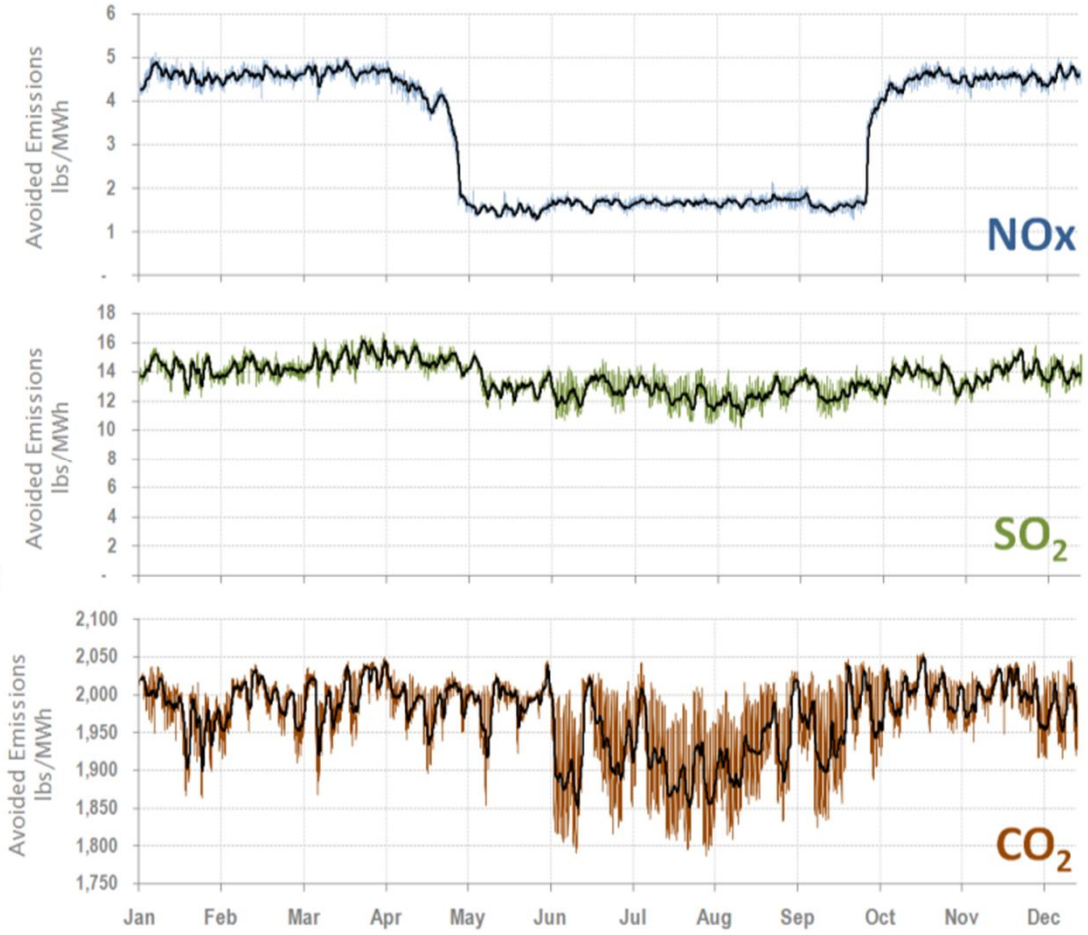
The chart shows the Base, Intermediate and Peak Load on a typical day and the unit fuel mix in a Mid-Atlantic Power Market.





TMM Model Methodology

1. **IDENTIFY** the marginal fossil fuel-fired units in a power market for each hour by using a load-following algorithm to calculate the incremental marginal emission rates.
2. **COMPILE** an annual hourly load profile of the energy savings or generation for the EERE technology and region under study.
3. **"TIME-MATCH"** the EERE hourly load profile against the marginal emissions profile on an hourly basis.
4. **CALCULATE** total avoided emissions from annual savings or generation on an hourly, monthly or annual basis.



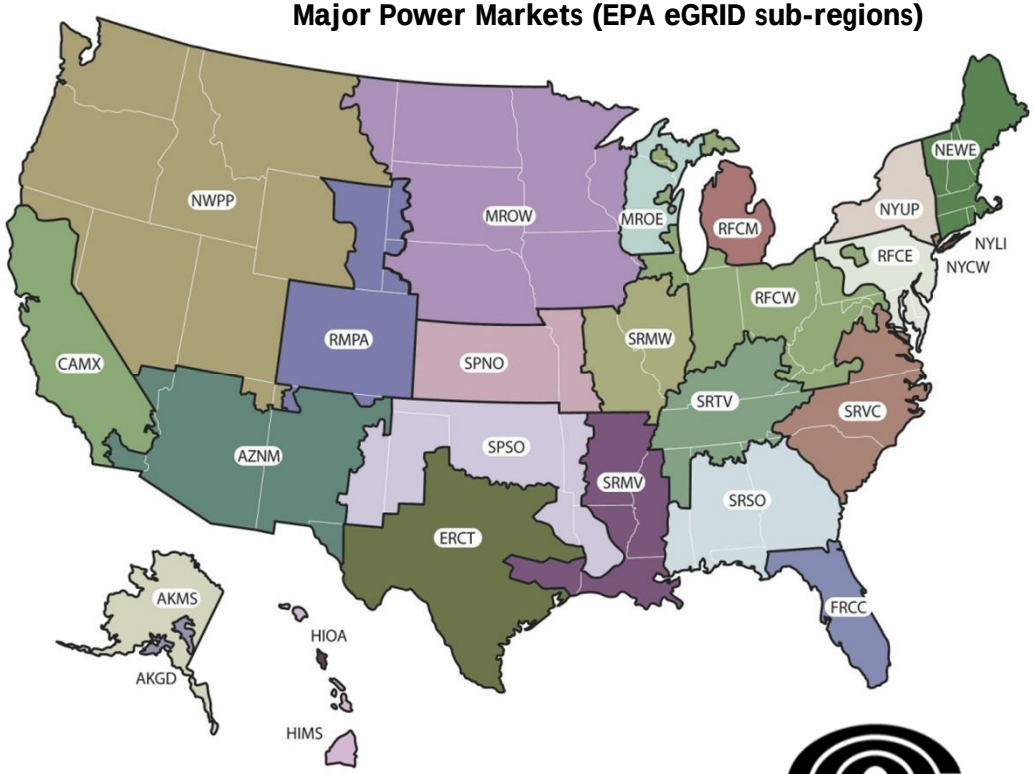
Matching the changes in energy savings or generation provides ***greater precision*** in measurement.

TMM Model Details

Measures the ***operational changes*** in air emissions resulting from changes in load or generation on the regional grid.

- Based on publicly available data from US EPA, US DOE - EIA, ISOs and industry sources.
- Emissions monitoring data for every hour of the year for all the US fossil-fueled generating units large enough to be required to report emissions in the EPA CEM program.
- Includes CO2, CH4, N20, NOx, SO2 and particulate matter (PM2.5) .
- Sensitive to regional boundaries which change with power demand and transmission constraints.
- Typically applied to major power markets (EPA eGRID sub-regions) but can also be analyzed down to the state, sub-state level or utility service area.

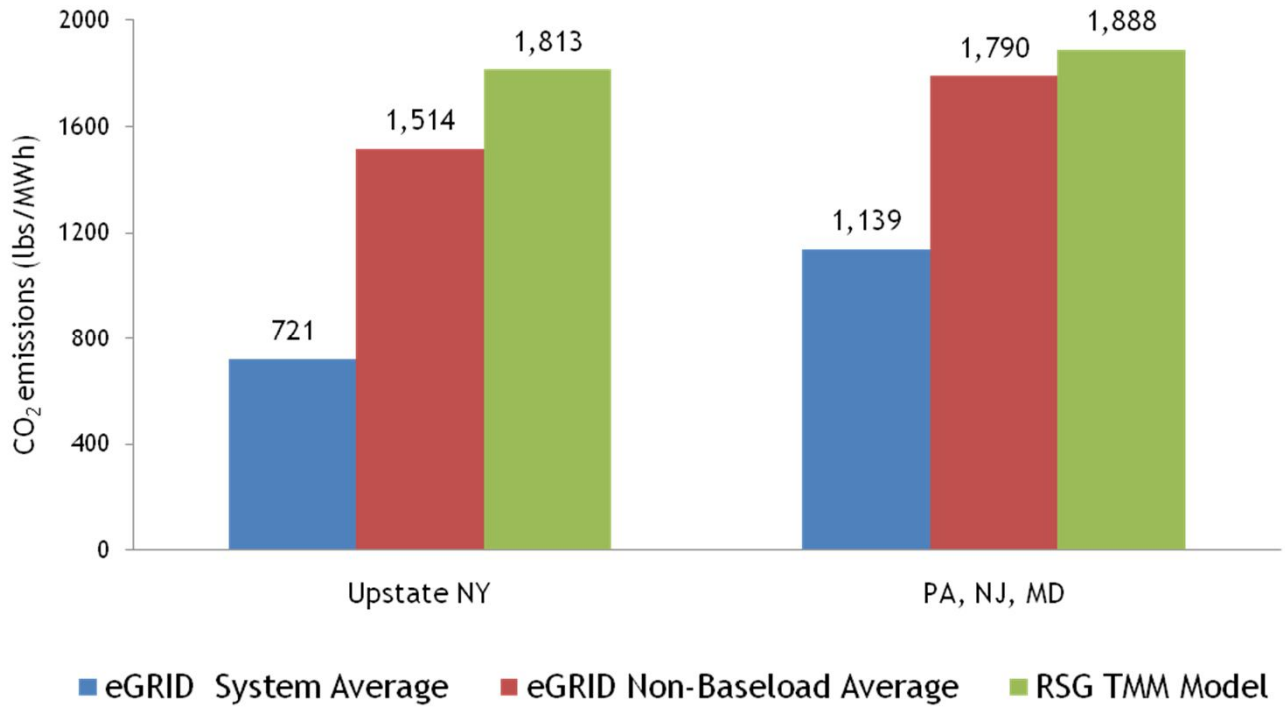
Major Power Markets (EPA eGRID sub-regions)



Comparison of Emission Rates

The chart compares CO_2 emission rates using two eGRID methods and the TMM model.

RSG's TMM model marginal emission rates are higher than published eGRID rates because eGRID emission rates were not designed to be used as marginal emission rates.



MWCOG Avoided Emissions Calculator

Dashboard

Inputs:

Annual Electricity Savings: 1

Electricity Savings Unit: MWh

Avoided Emissions Rate Unit: Pounds

Rate Type: Time Matched Marginal

Region: (Choose for Non-Baseload and System Average Rates Only) DC

Measure Type: (Choose for Time Matched Marginal Rate Only) Wind

Pollutant: Carbon_Dioxide

Time Period: Annual

Outputs:

Avoided Emissions Rate: 1917.11955 Pounds per MWh

Avoided Emissions: 1917.11955 Pounds

☑ Show Calculations

Calculations (Rates Taken from "Rate Lookup" Sheet):

Emissions Rate: Time Matched Marginal Rate * (1 kWh/1000 MWh)

Emissions: Time Matched Marginal Rate * 1 Pounds per MWh * (1 kWh/1000 MWh)

25 YEARS SINCE 1986 RSG INC. RESOURCE SYSTEMS GROUP, INC.

Lessons Learned from the MWCOG Experience

- The MWCOG obtained more accurate avoided emission measurements compared to previous use of eGRID output emission rates.
- Using the TMM model marginal analysis results in higher avoided emissions estimates which shows that EERE measures can be more cost effective.
- With the use of a model based calculator, routine analysis can be completed by agency staff without additional runs of the TMM model.

Contact Information

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http://www.mwcog.org/environment/air/EERE/default.asp

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